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No. 389

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TRANSLATIONS ON PEOPLE'S REPUBLIC OF CHINA

No. 389

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SCIENTIFIC AND TECHNOLOGICAL

STUDY OF CONTROLLED THERMONUCLEAR REACTION OUTLINED

Peking WU-LI [Physics] in Chinese Vol 5 No 4, Aug 76 pp 197-198

[Article by Theoretical Study Group of First Laboratory, Institute of Physics, Chinese Academy of Sciences: "Bravely Climb the Pinnacle of Controlled Thermonuclear Fusion For the Revolution"]

[Text] It has been 10 years since the stirring and seething Great Cultural Revolution. In these 10 years, deep world-shaking changes have occurred on China's various fronts. Scientific research work has also broken through the various obstacles of the revisionist line of Liu Shao-ch'i and Lin Piao, and has advanced swiftly and vigorously along the path pointed to by Chairman Mao. Our laboratory is engaged in studying the controlled thermonuclear reaction. Looking back over the history of the struggle and the accomplishments we have attained over these ten years and contrasting them with the "last-gasp" state of affairs prevailing in controlled [fusion] research prior to the Great Cultural Revolution, the ironclad facts eloquently prove that Chairman Mao's "Correctness or incorrectness in ideological and political lines determines all" is an unshakeable universal truth.

Before the Great Cultural Revolution: Fitful Non-accomplishment

The study of the controlled thermonuclear reaction is the search for a new source of energy for man. This is an internationally important area of scientific research. In our institute, however, [progress toward] this goal was rather fitful before the Great Cultural Revolution. There was a burst of enthusiasm in the planning stages, but not long after things got underway the banners were struck and the drums silenced, and everything folded up. This fitful starting and stopping was repeated through cycle after cycle, and for eight whole years, from 1958 to 1966, time wasted away, spent emptily; equipment lay idle, and funds were wasted. Except for some preliminary notion of controlled

[fusion] and a bit of work in the area of plasma spectra, virtually nothing was accomplished.

Why is it that controlled [fusion] research was delayed until it was half-dead? In the final analysis, it was because of the poison of Liu Shao-ch'i's revisionist line with regard to scientific research. That which those capitalist-roaders who implemented the revisionist scientific research line were peddling was merely "pedestrianism" and foreign-slave philosophy. They could only follow closely in the footsteps of the foreigners. Not only were they without any larger strategic vision; what was in even greater lack were stalwarts who would dare to forge ahead. Their enthusiasm was for projects in which some tangible results could be seen in the short-run, projects which merely copied the foreigners and braved no risks. And as for those areas in which even the foreigners were still far from success, even though these were politically and economically significant and academically worthy areas, to these they gave no thought; they did not dare to think of them. Mention of controlled [fusion] was included during project planning, but that was just so much window dressing; they had never dared to really get involved in it. Even if they wanted to dabble a bit in this area, they could not but rely on one or two bourgeois experts. Once they had accepted the course laid out by these bourgeois experts, endeavors without exception seemed to fall into a state of dreary lethargy.

Since the Great Cultural Revolution: High Enthusiasm Prospers

The revolution is the locomotive of history. The Great Cultural Revolution thoroughly eliminated the various crimes of the revisionist scientific research line, and Chairman Mao's revolutionary line was successfully implemented. And from that time onward, our institute's controlled [fusion] research work entered a renaissance, a new atmosphere of high and flourishing enthusiasm.

In the eyes of some, controlled [fusion] was an uncrackably tough nut. Some foreign experts had proclaimed that "the controlled thermonuclear reaction is the most difficult scientific research topic in all history." "Never before has there been an area of scientific research like controlled [fusion]: so much manpower has been invested in it, and our efforts have gone on for so long, yet today we are still groping." Our memories are still fresh. It was in 1959 when a Soviet revisionist expert paid a visit to our institute. With an incredulous stare and a contemptuous tone of voice, he asked us, "Why do you want to study this?" What he was implying was that we were such an impoverished nation and our standard [of living] was so low . . .

Could we really afford to carry on such research? Would we be able to chew what we had bitten off?

Chairman Mao's teaching concerning "destroying and casting out superstitions and liberating thinking" supplied us with inexhaustible energy. Why was it that the foreign countries could engage in such research and China could not? The Chinese people, who have arisen, will never be content with backwardness, and will never allow the super-powers to monopolize this realm. The Chinese people possess the will and the strength, and in the not too distant future they will certainly catch up to and surpass the world's advanced levels.

At the end of 1966, as the war drums of the Great Cultural Revolution resounded throughout the heavens, our institute's controlled [fusion] research was begun once more. A deep criticism of the revisionist scientific research line cleared the way for swift progress in scientific endeavors. In 1967 an angular constriction device and laser targeting were begun. In 1969 a focusing device was begun. In 1972 a ring current device (i.e., a "Tokamak" device) research effort was begun (refer to "Brief Explanation of Terminology" at the end of this paper [not included]). Now, with broad strides and heads held high, we are continuing to advance along a new course. Several years' work has opened before us a new arena of considerable scope. Such vigor and spirit were unimaginable before the Great Cultural Revolution.

Controlled [fusion] is a highly comprehensive and technically demanding research undertaking. In order to establish experimental facilities, it was necessary to come in contact with a series of problems concerning high-voltage engineering, automatic electronic control, super-high vacuums, high-temperature plasma diagnostics, and mechanical engineering, and it was also necessary to solve several new technological and engineering [problems]. We were all young scientists, mostly tyros who had just begun to take part in this work. Faced with a mission of such formidable complexity, what path should we follow? How could we establish our experimental facilities with greater, faster, better, and more economical results? Should we follow the principle of diligence and frugality in all endeavors in pioneer scientific research? How could we manage to catch up to and surpass [world levels] as rapidly as possible? This string of questions stood before us in sharp relief.

Which road to follow? Should we draw up a long list and with hands outstretched beg the leadership for instruments and equipment? Did everything have to be ready-made? No! If we wanted to catch up to and surpass [world levels], we could not sit

around like beggars with our hands held out; we would have to become doers! We would have to follow the road of independence, autonomy, and self-reliance pointed out by Chairman Mao. If we were to gain a footing domestically, we would have to rely upon our own strength and on the diligent and brave hands and boundless wisdom of the Chinese people, and deeply mobilize the masses so that everyone could work and contribute together. If something was lacking, we filled the gap ourselves. If needed equipment was lacking, we built it ourselves. If we were lacking in experience, we left our laboratories and learned from worker teachers and sought guidance from fraternal units, continuing all the while to courageously partake of actual experience and to work and learn at the same time.

Having been baptized in the struggle of the Great Cultural Revolution, the broad masses of scientific research personnel followed the road of Chairman Mao's "May 7" Instruction and accepted re-education from the laboring class and the poor and lower-middle peasants. Everyone criticized the bourgeois ideologies of achieving prestige and authority and disdaining physical labor inculcated by the revisionists, roused their revolutionary spirit, disregarded the relevance of professional specializations, and threw themselves enthusiastically into the struggle to build a laboratory. Those who had originally studied theoretical physics changed jobs and got involved in high voltage; those who had formerly studied optics now got involved in vacuums. If a laboratory was too small, they would go ahead and expand it themselves. We all did bricklaying and carpentry together with our worker teachers, our hearts all yearned toward the same goal, and we all sweated together. The cable trenches we dug ourselves. The iron grounding poles which were more than three meters long we pounded in one by one, and we lifted heavy condensers weighing several hundred kilograms all by ourselves. We had no screen cages, so we found some copper mesh and made them ourselves. There was no way to polish the large collector plates, so we picked up grindstones and ground them a little at a time, and after several days we had indeed ground them to a polish. Under the leadership of the worker propaganda teams and the revolutionary committees at all levels of the party organization, we united with the worker teachers and waged a tense struggle, and finally, late in the night of 26 December 1969, neutrons were sent out from the angular constriction device (refer to article "Experimental 100,000-joule θ-Constriction Device" in Vol 3 No 1 of this publication). This was the first time that neutrons had been observed in a Chinese controlled [fusion] experimental device, and everyone was wild with joy, running hither and thither to tell one another the news, and it was quite a while before the ebullience died down.

The spirit of self-reliance, diligence and thrift was further manifested during the course of the construction of the ring current device. There was no laboratory, so everyone fought courageously for two months to clean up a scrap shed piled full of junk and asbestos ash and carry in several hundred large condensers. In order to struggle for time against the imperialists, revisionists, and reactionaries, we studied charged power sources, micron plasma soldering guns, and plasma choppers ourselves. Under the direction of the worker teachers, we excavated foundations, build roofs, welded steel plate, and pounded copper bars. Of the ten major components of the ring current device, eight assemblies and two sub-assemblies were build by the institute's shop and our lab in conjunction with the Peking Institute of Electrical Engineering of the Chinese Academy of Sciences, and only two sub-assemblies were industrial products.

By doing these things ourselves, our proletarian determination was greatly heightened; by taking action ourselves, progress was greatly accelerated and large amounts of funds were saved; by doing the work ourselves and struggling alongside our worker comrades in the triple alliance, we learned the good ideology and work-style of the working class, which greatly hastened the reform of the world view of the scientific research personnel.

Revolution is the power which motivates scientific research undertakings. In 1972, impelled by the criticizing of Lin Piao and Confucius, neutrons were produced from the focusing device, and a comparatively systematic study was made of the use of laser interferometry in the angular constriction device. In 1975, during the high tide of studying the theory of proletarian dictatorship, the ring current device attained the international level for devices of similar scope (refer to article "How Number Six Controlled Thermonuclear Experimental Device Was Born" in Vol 4 No 1 of this publication). Every accomplishment shone with the glory of Chairman Mao's revolutionary line, and all were the result of the victory of proletarian ideology over bourgeois ideology. Our work experiences prove that under the leadership of the party, if the masses can be widely mobilized, all positive factors brought into play, superstitions destroyed and cast off, thinking liberated, revisionism constantly criticized, and Chairman Mao's great policy concerning "independence, autonomy and self-reliance" firmly adhered to, then there will be no height which cannot be climbed, and no undertaking without victory.

Teng Hsiao-p'ing, the most recalcitrant capitalist-roader within the party, in his frantic touting of rightist rehabilitation accused scientific research work since the Great Cultural Revolution of backwardness and of hindering the four modernizations.

A few recalcitrant capitalist-roaders in scientific and technological circles endlessly prattled such nonsense as "Your achievements never amounted to much, yet you insist on puffing them way up." Teng Hsiao-p'ing's sinister intention was a preposterous scheme to pull scientific undertakings back onto the old road of revisionism. We had had our fill of the hardships of insufficiency, slowness, inferiority, and wastefulness of the revisionist scientific research line before the Great Cultural Revolution. And it was precisely the Great Cultural Revolution which rescued controlled [fusion research] from its moribund state, gave it new life, and drove it rushing forward. We are history's witnesses, and we must use our personal experiences to exalt the magnificient accomplishments of the Great Cultural Revolution and indignantly criticize the criminality of Teng Hsiao-p'ing's rehabilitation and restoration. The rehabilitation did not win the people's hearts, and there was nothing to be gained by going backwards; the wheel of history must never be permitted to turn in reverse.

Seizing Even Greater Victory With Class Struggle as Key Policy

The great leader Chairman Mao has taught us that "within the scope of the production struggle and scientific experimentation, man is constantly developing, and Nature is also ceaselessly unfolding; never will there be a halt at some level, and so man must always constantly summarize his experience to make discoveries, inventions, creations, and progress."*

We shall certainly firmly remember Chairman Mao's teaching. We have clearly seen that credit for whatever accomplishments we achieved should be given to the great, glorious, and correct Chinese Communist Party, to the great leader Chairman Mao, to Chairman Mao's revolutionary line, and to the Great Cultural Revolution. And the battle is not over yet. The achievements which we have attained are merely the starting point for seizing new victory; they should serve as the stepladder for scaling new heights. The new battle is calling us. With class struggle as the key policy, we are determined to firmly adhere to the fundamental party line, to erect heroic aspirations and establish stalwart determination, to not fear difficulties and dangerous obstacles, to follow the road indicated by Chairman Mao, and to scale the pinnacles of science for the revolution.

(Refer to article "On Controlled Nuclear Fusion" in this issue.)

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* Excerpted from "Government Work Report of Premier Chou En-lai at First Session of Third People's Congress," Jen-min Jih-pao, 31 December 1964.

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Peking TUNG-WU-HSUEH TSA-CHIH [Zoology] in Chinese No 1, Feb 77

[Text] Animal Husbandry and Veterinary Medicine

7682
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THREE NEW SPRING WHEAT VARIETIES INTRODUCED

Peking K'O-HSUEH SHIH-YEN [Scientific Experiment] in Chinese No 1, Jan 77 pp 28-29

[Article by Wheat Section, Institute of Agriculture, Chinese Academy of Agriculture and Forestry: "A Brief Introduction of Three New Spring Wheat Varieties"]

[Text] Ching Hung No 7

Ching Hung No 7 was crossbred between 1969 and 1973 by the Chinese Academy of Agriculture and Forestry, using Ching Hung No 1 as the female parent plant and Narino 59 as the male parent plant through continuous selections from two generations a year with spring sowings in Peking and fall sowings in Hainan Island. The variety identification number is "K 13."

Its principal features and characteristics: long beard, red hull, white grain of comparatively small size, grain weight about 30 g/1,000 kernels, dwarf stems, plant height about 85 cm., resistant to lodging, early maturing, from germination to maturity about 82 days, resistant to stripe rust, stem rust and powdery mildew, resistant to leaf rust, grain filling fast, grain plump and rather stable, protein content 14.26 percent.

Between 1973 and 1975, experiments and demonstrations carried out in 10 provinces (municipalities and autonomous regions) and over 30 scientific research units, superior seed farms, state farms, and people's communes showed its yield was rather good.

In 1973 experiments for ascertaining and comparing varieties were carried out in Peking, Hainan Island, Pai-ko-chuang Farm of Tang-shan, Yuan-mou county of Yunnan. The yield was rather outstanding.

In 1974 this variety ranked second in variety comparing experiments at the Academy's Experimental Station. The yield was 600.4 chin per mou, 31 percent more than Ching Hung No 5's yield of 457.41 chin per mou.

In the Ta-hua-shan commune of P'ing-ku county, Peking Municipality, variety comparing experiments carried out by the Hou-pei-kung brigade achieved a yield of 582.5 chin per mou, 21.4 percent more than Tanori and 8.5 percent more than Potam. Again in the same year in the variety comparing experiments at Pai-ko-chuang Farm of Tang-shan, the yield was 27.6 percent more than K'o Ch'un No 14, 28.7 percent more than Ching Hung No 5 and 8.9 percent more than Liao Ch'un No 8. In 1975 the Hsi-kuan brigade of Chang-pei county, Hopeh harvested 685.2 chin per mou and the Wang-t'ai-pao experiment station, Ningsia produced 925.0 chin per mou. At present many regions are carrying out further demonstration, multiplication and extension. Judging from the experimental results from various regions, Ching Hung No 7 is a new early ripening variety, producing generally 400-500 chin per mou, while the highest yield could reach about 900 chin. The said variety bears many heads and kernals, has slender and flexible stems, and is rather resistant to lodging and suitable for soil with medium or high fertility.

Ching Hung No 8

Chin Hung No 8 was crossbred between 1969 and 1973 by the Chinese Academy of Agriculture and Forestry using Ching Hung No 4 as the female parent plant and MPO 66 as the male parent plant, and through continuous selections of two generations a year with spring sowings in Peking and fall sowings in Hainan Island. The variety identification number is "K 52."

Principal features and characteristics: long beard, red hull, red grain, good quality, protein content 15.4 percent, grain weight about 37 g/1,000 kernels, plant height about 90 cm., stems rigid, tolerant to fertilization, highly resistant to lodging, rather early maturing, from germination to maturity about 83 days, plant shape dense, leaf blade stiff, growth habit good, tillering medium, resistant to stripe rust, leaf rust and stem rust. From 1973 to 1975, experiments for ascertaining and comparing varieties were carried out in Peking, Hainan Island, Tang-shan city and An'tz'u county of Hopeh, Yuan-mou county of Yunnan, Hsi-yang of Shansi, Huhehot of Inner Mongolia, Yen-t'ai and Hui-min of Shantung, and Yin-ch'uan of Ningsia by the provincial, municipal or autonomous regional units of scientific research, seed farms, state farms and people's communes. The yield was outstanding. In the variety comparing experiments carried out by the Yang-chuang brigade of Hu-ke-chuang commune in Tung county, Peking Municipality, this variety won first place with a yield of 560.0 chin per mou. The yield at the Hsi-kuan brigade of Chang-Pei county, Hopeh Province was 835.4 chin per mou and that at the An-tz'u seed farm of Hopeh province was 635.0 chin per mou, 19.2 percent more than the Tanori and 10.8 percent more than the Potam varieties. The Agricultural Institute in Ningsia produced 1,004.0 chin per mou, 17 percent more than the Cajeme variety. From the experimental results of the units--including the Ch'en-chuang brigade of the Ta-hua-shan commune of P'ing-ku county of Peking Municipality, the He-pi Municipal Agricultural Institute of Honan Province, the Yen-t'ai Prefecture Agricultural Institute of Shantung, the Hui-min county Agricultural Institute of Shantung, and seed farms in the suburbs of Huhehot--the yield generally

was 10-12 percent more than Tanori. At present there are some regions and units which will adopt the methods of thin sowing and propagation in the South for further expansion of seed multiplication, demonstration and extension.

Judging from the experimental results from various regions, Ching Hung No 8 is a new, early maturing, high yielding variety, generally producing 400-600 chin per mou, while the highest yield could exceed 1,000 chin. The said variety has large heads, many kernels, high test weight, stiff stems, and good resistance to lodging, and is suitable for cultivation in soil with high fertility.

Ching Hung No 9

Ching Hung No 9 was crossbred between 1967 and 1973 by the Chinese Academy of Agriculture and Forestry using Ching Hung No 4 as the female parent plant and MPO 66 as the male parent plant, and through continuous selections of two generations a year with spring sowings in Peking and fall sowings in Hainan Island. The variety identification number if "K 55."

Principal features and characteristics: long beard, red hull, white grain, protein content 12.12 percent, grain plump, test weight about 32 g/1,000 kernels, short stems, plant height 85 cm, resistant to lodging, medium maturing, from germination to maturity about 84 days, grain filling fast, grain weight stable, resistant to leaf rust, stripe rust and stem rust. From 1973 to 1975, tests were conducted in 10 provinces (municipalities, autonomous regions) and over 30 scientific research units, state farms, seed farms and people's communes. The results showed that the yield was outstanding. In 1973 experiments for ascertaining and comparing varieties were carried out in Peking, Hainan Island and Yuan-mou county of Yunnan. The yield was outstanding. In 1974 the results of variety comparing experiments carried out by the P'u-teng production team in Yuan-mou, Yunnan, showed the yield was 9.3 percent more than the Tanori and 5.9 percent more than the Inia varieties. In 1975 the Pai-t'a No 2 team of Ta-chung-chih brigade of the Tung-sheng people's commune in Hai-ting region Peking Municipality planted 5 mou of this variety, and the average yield was 750 chin per mou. Last year, 18 varieties of wheat were used in variety comparing experiments in seed forms in the suburbs of Huhehot Municipality. Among them there were 12 Mexican wheat varieties. Ching Hung No 9 ranked first place with a yield of 762.5 chin per mou, 11.3 percent more than Cajeme and 22 percent more than Tanori. According to the results of similar experiments in the An-tz'u County Seed Farm of Hopeh, the yield was 675 chin per mou, 26.7 percent more than Tanori and 17.8 percent more than Potam. In Shantung, similar experiments at the Yen-t'ai Prefecture Agricultural Institute and the Hui-min County Agricultural Institute, also ranked the yield of this variety above all others, 14.3 percent more than Tanori, and 23.6 percent and 15.4 percent more than Cajeme and Saric respectively. In the Wang-tai-pao Experimental Farm of Ningsia, the yield was 1,054.7 chin. At present there are many regions preparing vigorous demonstration, multiplication and

extension programs. Experimental results from various regions indicate that this variety is an excellent one because of its wide adaptability, short stems, resistance to lodging, and high yield capacity of 500-600 chin per mou in general and as high as 1,000 chin or more in some cases. The said variety is suitable for cultivation in soil, with high fertility. In conclusion these three spring wheat varieties are suitable for cultivation under fair to excellent irrigation and fertilization conditions. It requires careful land preparation, adequate base fertilizer, and efficient nitrogen fertilizer as seed fertilizer. To assure good sowing quality, sowing should not be too deep and the seedling density should be about 35-40,000 seedlings per mou. Because the growing period of spring wheat is short and its growth process completes in a rather short time, top dressing should be applied early rather than late. Generally the first top dressing and irrigation should be carried out at the 3-leaf stage. Moreover, there must be adequate irrigation and fertilization during the critical periods of jointing, heading and filling. There should not be any shortage of irrigation in the whole growth period. In so doing it can be assured that there will be more spikes and grains, and larger and plumper grains to achieve high yield and stable production.

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OPTIMUM CONDITIONS FOR CULTIVATING LOWLAND RICE

Shanghai KUO-YING NUNG-CH'ANG NUNG-YEH CHI-SHU [Handbook on Agricultural Techniques for State Farms] in Chinese, compiled by the Agricultural Reclamation Bureau of the Ministry of Agriculture and Forestry, People's Publishing House, May 1975, pp 243-249

[Article: "Lowland Rice"]

[Text] 1. Seeding Time and Seedling Time

Requisite External Conditions: Upland nonglutinous rice begins to sprout and grow when the mean temperature reaches 12°C and lowland nonglutinous rice begins to sprout and grow when the mean temperature reaches 10°C. The optimum temperature for both types of nonglutinous rice to germinate and develop is between 28° and 32°C. Sowing can begin when the mean temperature exceeds 11° or 12°C and the water temperature stabilizes at above 12°C. During seedling time it is suitable to maintain a shallow layer of water in the paddy field and conduct drainage from time to time to keep up a constant level of moisture and a sufficient level of oxygen in the sprouting bed so as to help the rice seedlings to grow roots.

Unfavorable External Conditions: Seedlings are prone to rot when the mean day temperature is below 11° or 12°C and it rains continuously. When the temperature changes abruptly, say, dropping from 15° to 5°C, it is harmful to the growth of the seedlings and likely to cause them to rot. When the maximum temperature reaches about 40°C, it is also harmful to the growth of the seedlings.

Essential Points of Culture Technique: The main purpose of cultivating rice seedlings is to make a bid for raising the seedling rate and improving the quality of the seedlings under the prerequisite of timely sowing in order to meet the requirements for enough sprouts and healthy seedlings.

The standard of a healthy seedling is: leaves erect, seedling green, stem flat and coarse; grows in orderly fashion and is free of insect pest; root system well-developed and white roots in abundance; transplantable at a suitable age, not easily damaged, and greening up and tillering rapidly after transplanting.

The links in the technique of nursing healthy seedlings are as follows: (a) Raise seed quality: Select seeds with a high degree of varietal purity. Before sowing, sun the seeds and use the muddy water or salt water floatation method of seed selection. Also, it is necessary to do well the work of seed disinfection (for details see Seed Treatment on page 285). (b) Raise the quality of bud forcing: Prior to sowing, soak the seeds to make them absorb enough moisture and change the water daily so as to prevent the seeds from getting sticky. In soaking the seeds, do not fill the container to excess. When whiteness first shows, wash the seeds with clear water. Bud forcing should be done uniformly so as to prevent burning any sprouts. At the most, the length of a sprout should not exceed half the length of a grain of seed. (c) Raise the quality of the rice seedbed. Sufficient base manure should be applied to the rice seedbed. More decomposed organic fertilizer should be used. The fertilizer should be spread evenly and the seedbed should be level. (d) Grasp timely seeding, a proper rate of seeding, and a suitable age for seedlings and strengthen management of the manuring and watering of the seedbed in order to guarantee the cultivation of an adequate number of healthy seedlings.

For early cropping rice, seize the end of winter and the beginning of spring as the right time for sowing the seedling beds; for late rice, sow in time according to different varieties and different dates of transplanting seedlings. The age of a seedling in number of days should be ascertained in accordance with variety characteristics so as to forestall overaging or underaging. Then fix a seeding rate for the seedling bed according to the length of life of the seedlings to prevent seeding from being too dense or too sparse and determine a suitable seeding time according to aging time and transplanting time of the seedlings to prevent seeding from being too early or too late.

Below we introduce the essential points of the techniques of cultivating rice seedlings by using plastic sheetings to cover the nursery beds and transplanting seedlings with soil attached to the roots.

Plastic Sheet-Covered Cultivation of Rice Seedlings. On the basis of wet cultivation of rice seedlings, generally it is possible to advance the planting date by 10 days when the seedbed is covered with plastic sheetings. In the plastic sheet-covered cultivation of rice seedlings, attention should be paid to grasping the following problems in seedbed management:

(a) Strict Control of Seedbed Temperature. From the time of seeding to the full seedling and green-up stage (prior to the emergence of two leaves), it is necessary to seal tightly the seedbed so as to maintain a proper temperature and a constant level of moisture in the soil. Watering the seedbed is unsuitable. In a plot where water permeates quickly, the seedbed ditches may be watered every three or four days or the water in the ditches may be maintained at a constant level, with water not rising to the surface of the seedbed. Strictly check that there are no holes in the plastic

sheetings. After a rain, accumulated water on the sheetings should be removed forthwith. The temperature underneath the sheetings should be maintained at 30° to 35°C and if it exceeds 38°C, the sheetings should be lifted off at one or both ends to let air in so as to lower the temperature.

(b) Timely Ventilation to Harden Rice Seedlings. From the bifoliate to the trifoliate stage, ventilation should be integrated to harden the rice seedlings gradually. By day the plastic sheetings should be lifted off at one or both ends and, little by little, also on both sides. At night, when the air temperature drops to below 15°C, the entire seedbed should be covered well. In particular, attention should be paid to guarding against high temperatures by day and cold chill at night.

(c) Removal of Plastic Sheetings During Trifoliate Stage. When rice seedlings reach the trifoliate stage, the plastic sheetings should be removed, proper water level for seedling growth should be maintained, and leaf-rolling disease and bacterial wilt should be guarded against.

(d) Timely Top Dressing and Spraying to Destroy Weeds. During the trifoliate stage, make a second application of fertilizer to the rice seedlings thoroughly prior to transplanting so as to strengthen their cold resistance and prevent seedling rot. Five to seven days before pulling up the seedlings for transplanting, make a third or last application of fertilizer so as to help the transplanted seedlings to turn green again and resume growth. After transplanting, spread mulch and then spray the bed surface with a herbicide in liquid form or when one or two leaf blades of a weed shoot have emerged from the ground, spray with a herbicide to kill the weeds in conjunction with ventilation of the seedbed. (For full directions in the use of herbicide see the section on plant protection.)

Cultivation of Rice Seedlings by Transplanting Seedlings With Soil Attached to the Roots. Transplanting paddy rice seedlings with soil attached to the roots is also known as transplanting seedlings in the lump. Its distinctive features are: dense sowing, seedling age is shortened, economical use of seedbed, transplanting seedlings with soil attached to the roots means also a certain amount of fertilizer is attached, shallow planting will not cause seedlings to float, slowing down seedling growth is quick, and early tillering. All this should create favorable conditions to strive for abundant spikes, large spikes, and a high yield.

(a) Seedling Bed as Nursery Bed: The seedling bed should be as close to the field as possible. For the seedling bed, land that is elevated, level, and convenient to irrigate and drain should be selected. One method is to turn a flooded and prepared field into a nursery bed. Another method is to make use of a level paddy field as nursery bed. Do not plow it under, but just dig out the rice stubbles. Spread on the bed surface a layer of thin river mud to a thickness of 4 to 5 centimeters or a layer of rich, fertile soil and rotted organic fertilizer mixed with water to form a wet, soft mass. Smooth it down. Into the river mud nitrogen and phosphatic fertilizers should be blended. Proceed with seeding as soon as the mud has settled. After seeding, cover the seedbed well with plastic sheetings.

(b) Seeding and Seedling Age: Buds forced from rice seeds should crop up orderly. So, the seeding rate should be 600 to 800 catties per mu, seeding should be uniform, selection of grain should not be done with grain, and seeds should lie half exposed and half buried in the mud. After seeding, cover the seeds completely with a mulch and fine soil, and maintain a constant level of moisture in the bed soil. At the time of transplanting, see to it that each young sprout has 2.5 to 3 leaves and is 8 to 10 centimeters high and 15 to 20 days old. If the seedling is overaged, it turns yellowish and is slender and weak, and therefore dies easily.

(c) Rice Seedbed Management: Basically, rice seedbed management is the same as in the plastic sheet-covered cultivation of rice seedlings. From seeding to the full seedling stage, maintain a constant level of moisture in the seedbed. From the full seedling stage to the development of the second leaf, supply the seedbed ditches with a little water or no water at all in order to make it easy for the seedling to take roots and become healthy. Attention should be paid to lifting off the plastic sheetings to provide ventilation and harden the seedlings. Several days prior to transplanting or after the development of the second leaf, remove the sheetings gradually and make a third or last application of fertilizer to the seedlings. After the sheetings are completely removed, if the surface of the seedbed is dry and the air temperature is high, water it down so as to guard against yellowing and bacterial wilt.

(d) In removing the seedlings from the nursery bed for transplanting, the soil attached to the roots should be 1 to 2 centimeters thick. One or two days prior to the removal, treat the seedlings with a spray solution for the prevention of pests and plant diseases. Loading, transporting, and transplanting the seedlings must be done all at the same time. In order to avoid affecting their quality, the seedlings cannot be stacked up for a long time.

(e) At the time of transplanting seedlings with soil attached to the roots, quality requirements in the preparation of the field should be stricter than at other times. The field must be leveled smooth and harrowed lightly, base manure must be applied adequately, and water levels must be uniform. If the surface of the field is not level, a ridge must be built along its edges. After transplanting is completed in one plot, supply water to it immediately to protect the seedlings. Do not let them stand there drying in the sun.

2. Transplanting and Green Up Stage

Requisite External Conditions. At the time of transplanting, the mean day temperature should be above 15°C for upland nonglutinous rice and above 13°C for lowland nonglutinous rice. In early spring, the daytime temperature differs greatly from the nighttime temperature. With early cropping rice, if the weather is fine, the field should be drained in the daytime so as to raise the soil temeprature and in the nighttime it should be irrigated so as to protect the seedlings from cold damage.

Unfavorable External Conditions. After transplanting, strong winds or a heavy downpour will easily give rise to lodging and floating of the seedlings and in the event of a drought the seedlings will be liable to withering. The temperature is relatively low when seedlings of early cropping rice are transplanted and in case of a cold wave, it may delay the seedlings in becoming green again. In summer, the air temperature is high and sunshine is strong, and it will easily cause the seedlings to wither.

Essential Points of Culture Technique

(a) Seeding Transplanting: Transplanting should be done early and at the right time. It should be shallow, but not so shallow as to cause the seedlings to float. Maintain a shallow layer of water in the paddy field so as to promote early tillering, strive for tillering in low nodal positions, and increase the number of effective tillers. When transplanting is done mechanically, attention should be paid after transplanting to preventing omitted transplanting, folded seedlings, and seedling hurting, controlling the depth and uniformity of seedlings in each hole, and carrying out supplemental planting of seedlings in good time. When transplanting is done manually, see to it that the rows are straight, guarantee dense planting, and carry out transplanting as shallow as possible. The density of planting should vary with seed variety and fertility of the field. Generally, there are 25,000 to 35,000 holes to a mu and 7 to 10 seedlings to a hole. That means between 200,000 and 350,000 basic seedlings should be transplanted in a mu.

(b) Fertilizers: Rotted organic fertilizer, green manure, and phosphatic fertilizer should be regarded as the main base fertilizers for the paddy rice field. They should be applied either at the time of plowing or before harrowing. Prior to transplanting, chemical nitrogenous fertilizer should be applied as surface fertilizer to promote the rapid greening up of seedlings.

(c) Chemical Weed Control. Three or four days after transplanting, let in a shallow layer of water. Add 1 to 1.5 catties of a 25 percent wettable herbicide or 1 to 1.5 catties of 80 percent PCP (pentachlorophenol) for each mu to between 30 and 40 catties of fine wet soil to form a poison soil or mix them evenly with a chemical fertilizer and scatter it. After applying the substance, maintain a shallow layer of water in the field.

(d) Irrigation: Transplanted small seedlings require shallow irrigation and frequent watering. For large seedlings, low water is also required during transplanting and the green up stage. In the case of saline-alkali soil, after transplanting, let in water to a depth equivalent to two-thirds of the height of a seedling so as to protect the young plant. After the green up stage, maintain a shallow layer of water in the field in conjunction with proper drainage so as to promote the development of its root system.

3. Tillering Period

Requisite External Conditions. An air temperature of about 30°C is suitable. Adequate nutrient and sunshine can promote tillering in abundance and at a rapid rate.

Unfavorable External Conditions. Tillering will be restricted if the mean day temperature drops to below 15°C. Dry weather and an air temperature above 37°C will be detrimental to tillering. Rainy weather and inadequate sunshine will not only delay tillering, but also produce slender and weak stems, rendering them prone to infection with rice blast. If the temperature difference between daytime and nighttime is too great, it will be harmful to tillering.

Essential Points of Culture Technique. During the tillering stage, take advantage of regulating the amount of water and fertilizer in the field to promote early tillering, control the number of ineffective tillers, and make seedlings grow healthily but not excessively. Generally, only tillers possessing four or more leaf blades have a chance of becoming effective tillers. The earlier a tiller appears, the lower its tillering position, and the greater its chance of becoming an effective tiller.

(a) Irrigation: During the tillering period, it is necessary to irrigate plot by plot in accordance with the local weather, nature of the soil, condition of the seedlings, and weed situation. During early tillering, maintain a shallow layer of water and raise the water temperature and soil temperature in order to promote early tillering and strive for more tillers which can form ears. During final tillering, bake the field properly to keep down ineffective tillering and stop or reduce irrigation to guard against lodging. However, baking a field of saline-alkali soil is likely to give rise to secondary salination and dead seedlings. This must be distinguished from other soils.

(b) Additional Manuring: The intake of a seedling of nitrogen during the period from greening up to jointing is relatively high, constituting 30 to 40 percent of its total amount of nitrogen absorption during the entire growth period. On the other hand, its intake of phosphorus and potassium is slightly less, constituting 20 to 30 percent of its total amount of absorption. Additional manuring during the tillering period is the key to strengthening effective tillering and striving for a high heading rate per tiller. Six or seven days after greening up, make yet another application of fertilizer. In the North, as far as single-crop rice is concerned, and in the South, as far as double-crop early rice is concerned, it is especially important that early application of fertilizer during the tillering period be grasped so as to promote early tillering. With intermediate rice and single-crop late rice, make an additional application of fertilizer. Simultaneously with additional manuring, weeding in the field should be carried out.

(d) Treatment and Control of Pests and Plant Diseases: Attention should be paid to the occurrence of white withering, rice blast, sheath and culm blight, rice leafhoppers, rice stem borers, etc.

4. Jointing and Earing Stage

Requisite External Conditions. During the early stage of jointing, young spikes will begin to differentiate. The temperature suitable for differentiation is above 20°C. If the weather is clear, nutrient is adequate, temperature variation is not great, and there is no storm of wind and rain, it will be favorable to the jointing and earing of paddy rice.

Unfavorable External Conditions. Insufficient light is harmful to jointing and earing. If the temperature drops to below 15°C, such phenomena as leaves turning yellowish and slowing down of the rate of spike differentiation will arise. During the earing stage, if the mean day temperature is lower than 18°C, small, light grains with no germination potential are likely to be produced.

Essential Points of Culture Technique. After jointing, paddy rice enters a reproductive development stage which will decide the formation and growth of the grain bearing spike of the rice plant. Generally, the number of spikes in a rice field which has a per mu yield of about 1,000 catties is between 30,000 and 40,000 to a mu.

(a) Irrigation: After baking the field and stopping or reducing the irrigation of the seedlings during final tillering, it is necessary to raise the layer of water to 6 or 7 centimeters right up to three or five days prior to earing. If the vegetative growth of the seedlings is excessive, the field should be baked anew, this time lightly. The length of time of baking depends on the condition of the seedlings.

(b) Additional Manuring: During the period from jointing through spike differentiation to earing and flowering, the nitrogen requirement of paddy rice constitutes 50 to 60 percent of its total absorbing capacity and the phosphorus and potassium requirement 60 to 70 percent of its total absorbing capacity. In the final stage of tillering, prior to jointing, grasp in good time the application of fertilizer during the earing stage in order to promote the growth of healthy stems and big ears. See to it that fertilization during the earing stage is not overdone, otherwise the seedling is liable to excessive vegetative growth. Overly late fertilization may cause the seedling to develop a predilection for greening and be late in coming to maturity, produce numerous half-filled grains, and be infected easily with rice blast.

(c) Treatment and Control of Pests and Plant Diseases: Attention should be paid to the occurrence of rice blast, sheath and culm blight, rice leaf-hoppers, rice plant skippers, horizontal leaf rollers, etc.

5. Earing and Flowering Period

Requisite External Conditions. The suitable temperature for the earing and flowering period is between 28° and 32°C. Clear weather, a relative humidity

of between 70 and 80 percent, and a slight breeze are all advantageous to florification and pollination.

Unfavorable External Conditions. Rainy weather and a mean day temperature lower than 20°C not only are unfavorable to florification and pollination, but also are prone to cause infection with rice blast or produce half-filled grains and small grains with no germination potential. If the temperature is lower than 17°C for upland nonglutinous rice or 15°C for lowland nonglutinous rice, the rate of fructification will lower markedly. Windstorm and insufficient sunshine also are detrimental to florification and fructification of paddy rice.

Essential Points of Culture Technique. During the earing and flowering stage, if the water requirement is met and nutrient is adequate, the seeds will be filled and become plump and ripen in good time.

(a) Irrigation: Maintain a constant layer of water in the field and guard against suspension of water supply or drainage of the field. But if the vegetative growth of the seedlings is excessive, the field may be alternated between dry and wet.

(b) Treatment and Control of Pests and Plant Diseases: Pay heed to the treatment and control of rice neck blast disease, rice leafhoppers, horizontal leaf rollers, and paddy rice borers.

6. Ripening Stage

Requisite External Conditions. Adequate moisture, nutrient, and light are required during the filling stage. A great temperature difference between daytime and nighttime will be beneficial to the accumulation of nutrient. Clear weather is required during the wax ripe stage.

Unfavorable External Conditions. With late rice in the South and single-crop rice in the North, when the mean day temperature is below 15°C, the ripening stage will be delayed manifestly. A storm of wind and rain will give rise to lodging and shattering of grains, lower the quality of the crop, and affect its harvest. During the filling stage, if soil moisture is insufficient, half-filled grains will increase in number and the yield will decline.

Essential Points of Culture Technique. Between 63 and 75 percent of the nutrient accumulated in a paddy rice grain stems from photosynthesis after the earing stage. Therefore, during the filling stage of paddy rice, good nutrition conditions are still necessary. The root system must be prevented from decaying early and the photosynthetic capacity of the leaf blades must be preserved in order that a great deal of nutrient be transmitted to the grains.

During the filling stage, maintain a shallow layer of water in the field. However, in the latter part of the filling stage, the field may be alternated

between dry and wet, but primarily wet. During the early part of the wax ripe stage, drain the field and let it dry in the sun to create the conditions for harvesting so that the crop may be gathered at the right time.

Appendix: Cultivation of Paddy Rice by Direct Seeding

Under the conditions that water sources are adequate, the field is level, and irrigation and drainage are convenient, mechanized direct seeding of paddy rice may be carried out. No matter whether it is direct seeding on a paddy field or on a dry field, one factor that must be grasped is the protection and maintenance of proper seedling growth. At the same time, this must be kept up with such cultivation measures as the removal of weeks and strengthening of watering and manuring management in order that a high yield be achieved.

(a) Leveling of Surface of Field: Direct seeding corresponds to cultivation of seedlings in a field. Whether the quality of soil preparation is good or bad will have a direct effect on the protection and maintenance of proper seedling growth and on watering and manuring management. Soil preparation must be precise, the surface of the field must be level, and the layer of water in the field must be of a uniform height. In saline-alkali soil particularly, if the field is uneven, rice seedlings planted in low places will drown and those planted in high places will suffer from excessive alkali. The requirements of soil preparation for direct seeding on a paddy field are the same as on a rice transplant field.

(b) Guaranteeing Perfect Seedlings:

Timely Seeding--In the North region, if direct seeding of early cropping rice is carried out too early, temperature variation is great, or management cannot keep pace with development, it is apt to give rise to damping-off, a fungous disease which attacks and causes rotting of seedlings. Generally, it is necessary to seed when the temperature has steadily risen to about 15°C.

Shallow Planting--In fields, which are to be sown dry and irrigated later, seeding had "better be shallow than deep." The depth of seeding should not exceed 1 centimeter. For this reason, seeds should be treated for attaching to soil so as to prevent floating of that portion of seeds sown on the surface soil. If it is direct seeding on a dry field, the seeds may be planted 2 to 4 centimeters deep in moist soil. If they are planted too deep, seedling emergence through the top soil will be difficult. Seeds sown directly on a paddy field may lie half exposed and half buried in the mud. It is not suitable for them to be planted too deep.

Timely Drying of Field in the Sun--In a directly sown field where irrigation follows seeding, grasp firmly timely drainage of the field after the seeds have germinated so as to stimulate the young plants to take roots and strive for perfect, healthy seedlings. If the moisture content of the soil

is high and the seeding is deep, the time of drainage will have to be a little longer. This is to avoid having too much moisture in the soil during seed germination, in which case the sprouts will only continue growing without taking roots.

Moreover, if direct seeding on a dry field is adopted owing to inadequate water sources during the early stage of plant growth, after sowing, firm soil immediately, maintain or increase soil moisture, and strive for perfect seedlings. In case that rain comes prior to seedling emergence and the ground is one hard slab, the work of breaking the crust soil should be carried out.

(c) Conservation of Water for Healthy Seedlings: When the young seedlings enter the trifoliate period, it is necessary to maintain a constant layer of water in the field so as to attain the conservation of water for healthy seedlings and the inhibition of weeds. This is the main link in the culture technique of direct seeding on a dry field. If the conservation of water is carried out too late or a constant layer of water cannot be maintained in the field over a long period of time, it will easily give rise to damping-off disease, bacterial wilt, or weak seedlings.

(d) Weed Control: Key measures include: (i) Practice rotation between dryland crop and paddy rice; (ii) Carry out land preparation and soil moisture conservation to induce weeds to grow and prior to seeding, harrow the field to remove them; (iii) Practice timely conservation of water to inhibit weed growth; (iv) Practice weed control with chemicals; and (v) Practice timely eradication of weeds by hand or with weeding rakes.

(e) During final tillering, it is necessary to bake the field in order to prevent lodging.

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[Text] Lhasa, July 1, 1977 (HSINHUA)--Southeastern Tibet has China's third biggest concentration of virgin forests, next only to the greater and lesser Khingan Mountains in northeast China and Szechwan and Yunnan provinces in Southwest China, according to a survey made by a scientific expedition to the Tsinghai-Tibet Plateau organized by the Chinese Academy of Sciences.

A rough estimate shows that Tibet has at least 1,000 species of trees belonging to more than 100 families. Almost every major species of tree in the northern hemisphere can be found in the region.

Members of the scientific expedition discovered in Tibet species of plants left over from the tertiary period. These plants provide evidence supporting the proposition that Tibet was not attacked by glaciers during the quaternary period and could therefore give shelter to tertiary plants. They also furnish valuable information for the study of the origin and dissemination of plants in the northern hemisphere.

An outstanding feature of Tibet's virgin forests is that the usual geographical distribution of varied species of trees, namely, from the tropics to the frigid zone, is visible at different altitudes of mountain sides and valleys in a given area.

In addition to the tree species native to the Himalayan region, there are also those belonging to the floristic composition of other parts of East Asia and of North America, Northern Eurasia, the Mediterranean and Indo-Malaya.

Among the over 40 varieties of common coniferous trees are the Himalayan pine, the Himalayan fir, Pinus Densata, Picea Likiangensis Var, Balfouriana, and Sabina Wallichiana. There are also such rare species as Taxus, Podocarpus and Amentotaxus. Spruce and fir growing in Linchi, Meto and Tsayul are the species found only in Tibet.

In the humid valleys of the Yalu Tsangpo River, no more than 1,000 metres above sea level, there are tropical trees belonging to Dipterocarpceae. There are also evergreen sub-tropical broad-leaved trees, shrubs and sparsely growing cypress.

The scientists noted that most of the coniferous and broad-leaved trees grow faster in Tibet than their counterparts in Eastern and Northern China. Some have a longer life span and are more disease-resistant. This provides better conditions for natural regeneration.

The spruce growing in Pome Region, up to 80 metres high, is the tallest tree found in Tibet. The Tungmai oak is up to 6 to 8 metres in girth. In some places a single tree provides no less than 30 to 40 cubic metres of timber. The highest rate of timber reserves reaches 2,000 to 3,000 cubic metres per hectare.

Many varieties of hard wood trees with straight trunks offer good construction material. Some broad-leaved camphor, phoebe, cinnamomum, castanopsis and oak are close-grained and beautiful in texture, and worm-resistant. There are over 20 varieties of oil-bearing trees, of which walnut trees are the most widespread. One walnut tree yields a yearly average of 150 kilogrammes of walnuts, the maximum being 500 kilogrammes. The walnut kernel contains 60 to 70 percent oil.

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